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Application of Teaching Methods (Ball Reflection to the Wall, Throwing Machine, in-pairs) and Eye Coordination to Increase the Drive Beating Skills on Tennis

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Abstracts. This experimental study aims to determine differences in teaching methods and eye and hand coordination of drive punch skills in playing tennis. The teaching method is divided into three, namely teaching the reflection of the ball to the wall, teaching the throwing machine, and teaching in pairs. This research was conducted at Faculty of Sports Science, Universitas Negeri Makassar. This research applied experimental method using a 2x3 factorial design. The sample of this research consist of sixty students, they are divided into six groups that consist of ten people each. The data analysis technique was the analysis of variance (ANOVA) and continued with the Tukey test at the significance level $\alpha = 0.05$. The three teaching methods in this study have different influences on the drive skills in playing tennis. This research shows that in order to improve the drive skills in playing tennis, it is necessary to involve hand-eye coordination factors in which the physical condition elements mentioned above. A better influence compared to the method of teaching bounce ball to the wall and the throwing machine teaching method on the drive punch skill in playing tennis. Based on the findings in this study, it is expected to have implications for the development of teaching methods to improve punch drive skills in playing tennis.

Keywords: Ball Reflection to the Wall; Throwing Machine; in-pairs teaching method; Eye Coordination; Drive Beating Skills; Tennis

INTRODUCTION

The purpose of National Education System is to educate the life of the nation following its purpose of building quality human beings both physically and spiritually (Siswoyo, 2013). This is in line with the purpose of sport, which can excel in sports so that it can elevate the dignity of the Indonesian nation in the international forum. Indonesia Number 3 of 2005 concerning the National Sports System, that the sports guidance system must be carried out through 3 (three) pillars namely; educational sports, recreational sports, and achievement sports (Law of the Republic of Indonesia, 2005). Mastery of tennis field skills has physical condition readiness requirements to be able to master a variety of basic techniques and playing abilities. Physical conditions needed for tennis, among others, are strength, speed, flexibility, endurance, explosive power, balance and coordination. Field tennis game as one of the

sports that has specific basic techniques, such as; forehand drive, backhand drive, service, volley, lob, drop shot, half volley, and smash techniques (Pluim, Groppel, Miley, Crespo, & Turner, 2018). Strategies and correct teaching methods must support coaching of field tennis sports achievement so that it is more effective and efficient in achieving the expected goals. The individual internal factors of an athlete also play an essential role in achieving sporting achievements (Kerstajn, Lupo, Capranica, & Capranica, 2018), because athlete/everyone has different levels of eye and hand coordination and motor skills that vary in sports.

Skill is an activity or task that has a specific goal or goal to achieve performance quality indicators (Magill, 2011). Skills are a description of a person's level of ability that varies on a motoric task, and the movement in question is one's ability to (motor) at a certain level. Magill (2011) argues that movement skills are voluntary activities or tasks that require the head, body, and limb movements to achieve a goal. Motion skills are goal-oriented actions or tasks that require voluntary body or limb movements and must be learned (Coker, 2017; Schmidt, Lee, Winstein, Wulf, & Zelaznik, 2018).

The level of motor skill needs in each branch of sport varies, depending on the motor tasks required in the sports activity itself. Motor skills can be classified into three parts (Jenkins, 2005), namely: (1) gross and fine motor skills, (2) sequenced, interrupted and continuous motor skills, and (3) open and closed motor skills. Gross motor skills are skills that involve or use large muscles from the body and usually, the whole body is also driven by directing a considerable amount of energy whereas fine motor skills are skills that involve small muscle groups with enough and minimal range. The process of teaching a punch drive-in playing tennis will succeed if a player is supported by factors that are very supportive such as the type of teaching methods applied and the factors of mobility possessed by individuals without ignoring other supporting factors. This success is inseparable from the series of learning processes or teaching processes carried out in the form of individual teaching that leads to the objectives to be achieved.

In principle, learning motion (motor learning) is a learning process that aims to improve various kinds of optimal movement skills efficiently and effectively (Becker & Fairbrother, 2019; Bucher & Hernández, 2016; Kal, Prosée, Winters, & Van Der Kamp, 2018). Magill (2011) states that motor skills are activities or activities that result in the head, body, and all movements in achieving a goal. The movement skills for each sport are not the same, depending on the required motion assignments of the sporting activities. Several factors influence the achievement of movement learning skills. Factors that influence motion learning are (1) understanding what must be learned, (2) the opportunity to respond, (3) the existence of feedback, and (4) reinforcement.

To master the drive skills, it can be done with several teaching methods including the method of teaching the reflection of the ball to the wall, the method of throwing machine teaching and the method of teaching in pairs. The three methods of teaching are beneficial for students to be able to master the punch drive skills. Besides, physical condition is also very supportive of one's appearance in teaching or competition, including good hand-eye coordination, will be able to contribute to driving punch skills.

Coordination of movements in sports is needed to perform a pattern of movement that requires a combination or a combination of several body parts such as the eyes and hands and hearing to display movement skills. Coordination is also an integral part of hand-eye coordination; in fact, the notion of coordination has been regarded as an equivalent of the word hand-eye coordination and skills. Coordination is the ability of muscles to control movements appropriately in order to be able to achieve a specific physical task (Bompa, 1994; Bompa & Buzzichelli, 2018; Carrera & Bompa, 2007; Kirk, MacDonald, & O'Sullivan, 2006; Myers, Lee, & Kostelis, 2018) The same idea was stated by Schmidt, Lee, Winstein, Wulf, and Zelaznik (2018) that coordination is a combination of two or more behaviors, in which one is related to one another in producing a movement skill. The same opinion was stated by Sage that, general coordination is the ability of the whole body to adjust and regulate motion simultaneously when making a move. Kirk et al. (2006) argue that coordination is the ability to carry out movements with varying degrees of difficulty quickly and efficiently and with full accuracy. Jonath and Krempel (1981) revealed that coordination is the cooperation of the central nervous system as a system that has been harmonized by the process of stimulation and obstacles and skeletal muscle when the direction of movement is directed.

Next, Kirk et al. (2006) define coordination as a harmonious relationship of the relationship of mutual influence between muscle groups during work, which is indicated by various levels of skill.

METHOD

This study aims to examine the effect of the method of teaching bounce ball to the wall, the method of teaching the throwing machine and the method of teaching pairs in terms of eye-hand coordination on punch drive skills in playing tennis for tennis students of the Faculty of Sport Science Makassar State University. This research was conducted at the Tennis Court Sports Building in the Banta-Bantaeng Campus, Faculty of Sport Science, Universitas Negeri Makassar, South Sulawesi Province. When researching through the initial test procedure, then carried out the experimental phase for 6 (six) weeks or 18 meetings. After a treatment period of 6 (six) weeks, it is continued by taking the drive punch skill data as a final test. The method is a way to get the truth through observation. Furthermore, the scientific method is a procedure of the process of searching for truth, with steps to identify problems and formulate them, study literature, if necessary, formulate hypotheses, collect and process data, test hypotheses and draw conclusions (Haerens & Tallir, 2012; Hughes & Sharrock, 2016; Myers et al., 2018) The experimental method that were used in this research with 2x3 factorial design (Levine & Parkinson, 2014). The research design can be seen in the following table 2.

Table 2. Research Design

	Ball Reflection to the Wall (A1)	**Throwing Machine Method (A2)**	**In-pairs Method (A3)**
High hand-eye coordination (B1)	A1B1 >	A2B1 <	A3B1
Low hand-eye coordination (B2)	A1B2 >	A2B2 <	A3B2
Total	**A1 >**	**A2 <**	**A3**

This research was conducted at Faculty of Sports Science, Universitas Negeri Makassar. The experimental method was applied using a 2x3 factorial design. Sixty students participated in this research, they are divided into six groups, each group consists of ten people. The data analysis technique was the analysis of variance (ANOVA) and continued with the Tukey test at the significance level $\alpha = 0.05$. The three teaching methods in this study have different influences on the drive skills in playing tennis. The population is all things that want to be explained or predicted or controlled can be examined. In this study, data collection techniques were carried out based on the variables involved like the dependent variable, the independent variable, and the attribute variable. The technique used in analyzing data is a two-way analysis of variance (ANOVA) with a significance level = 0.05 (Levine & Parkinson, 2014).

RESULTS AND DISCUSSION

Result

A discussion of the research results put forward is as follows. (1) The results of the analysis of variance analysis about the difference in effectiveness between the two teaching methods as a whole, it can be concluded that there is a difference between the method of teaching bounce ball to the wall with the method of teaching the throwing machine to the drive skills in playing tennis. (2) The results of the analysis of variance analysis about the difference in effectiveness between the two teaching methods as a whole, it can be concluded that there is a difference between the teaching method of the method of teaching the reflection of the ball to the wall with the method of teaching the punch drive skills in playing tennis. (3) The results of the analysis of variance analysis about the difference in effectiveness between the two teaching methods as a whole, it can be concluded that there is a difference between the throwing machine teaching methods with the teaching method in pairs to the results of the drive punch skills in playing tennis. (4) Based on the summary analysis of variance analysis results obtained by Fcount Interaction (FA * B) = 3,610 and Ftable = 3.17, it appears that Fcount> Ftable, so the null

hypothesis (H0) which states there is no interaction between teaching methods and hand-eye coordination of skills Drive blows are rejected and alternative hypothesis (H1) is accepted. Based on this, it can be concluded that hand-eye coordination is very important to the drive punch skill in playing tennis. (5) Based on the results of the analysis of variance analysis with the Tukey test in table 3, the value of Q count (Qc) = -10,800 is smaller than Q table (Qt) = 3.15 or Q count <Q table. It can be concluded that there is a significant difference between the method group teaching the reflection of the ball to the wall (A1B1) with the throwing machine teaching method group (A2B1) in the high hand-eye coordination group on the punch drive skills in playing tennis. (6) Based on the results of the analysis of variance with the Tukey test, the value of Q count (Qc) = 2,500 is smaller than Q table (Qt) = 3.15 or Q count <Q table.

It can be concluded that there is no difference between the method of teaching the reflection of the ball to the wall (A1B1) and the paired teaching method (A3B1) in a group of students who have high hand-eye coordination of the drive punch skills in playing tennis. (7) Based on the results of the analysis of variance in the Tukey test, the value of Qcount = 13,300 is greater than Qtable = 3.15 or Qcount> Qtable, so it can be interpreted that there is a significant difference between the ejecting machine teaching methods (A2B1) and paired teaching methods (A3B1) for students who have high hand-eye coordination of drive punch skills in tennis. (8)

Based on the results of the analysis of the variance of the advanced Tukey test, the value of Qcount = - 9,400 is smaller than Qtable = 3.15 or Qcount <Qtable, so that it can be interpreted that there is a significant difference between the method of teaching ball to wall reflection (A1B2) and the ejection machine teaching method (A1B2) A2B2) for students who have low hand-eye coordination of drive punch skills in tennis. (9) Based on the results of the analysis of variance in the Tukey test, the value of Qcount = - 9,900 is smaller than Qtable = 3.15 or Qcount <Qtable, so it can be interpreted that there is a significant difference between the method of teaching the reflection of the ball to the wall (A1B2) with the teaching method in pairs (A3B2) for students who have low hand-eye coordination of punch drive skills on tennis. (10) Based on the results of the analysis of variance in the Tukey test stage, the value of Q count = - 0.500 is smaller than Q table = 3.15 or Q count <Q table, so it can be interpreted that there is no difference between the ejection machine teaching method (A2B2) and paired teaching method (A3B2) for students who have low hand-eye coordination on drive punch skills in tennis.

Table 3. Summary of ANOVA Level Results with Tukey's Test

Compared hypothesis group	Absolute Mean Difference Score (Qcount)	HSD Crisis Score (Qcount)	Sig.	Notes
A_1 dan A_2	5.100*	2.95	0.027	There is a difference
A_1 dan A_3	-5.250*	2.95	0.020	There is a difference
A_2 dan A_3	-10.350*	2.95	0.000	There is a difference
Interaction AxB	3.610	3.17	0.034	There is interaction
A_1B_1 dan A_2B_1	-10.800*	3.15	0.000	There is a difference
A_1B_1 dan A_3B_1	2.500	3.15	0.961	All the same
A_2B_1 dan A_3B_1	13.300*	3.15	0.000	There is a difference
A_1B_2 dan A_2B_2	-9.400*	3.15	0.001	There is a difference
A_1B_2 dan A_2B_2	-9.900*	3.15	0.000	There is a difference
A_2B_2 dan A_3B_2	-0.500	3.15	1.000	No difference

Discussion

Based on the description of the results of data analysis and testing of research hypotheses that have been conducted, it can be explained as follows: The results of data analysis and testing of research hypotheses that have been carried out using the two-way analysis of variance

(ANOVA) approach and continued with the Tukey test, the discussion of research results such as following:

1. **The Difference Between the Method of Teaching Ball Reflection to the Wall (A1) with the Throwing Machine (A2) Method Against Drive Punch Skills in Tennis Court Games**

The teaching method used in this study is basically to improve punch drive skills in the sport of tennis. The method of teaching the bounce of a ball to the wall has almost the same characteristics as a drive punch movement. The drive punch skill is a very important punch in playing tennis (Pittman & Jernigan, 1962). In this research, three methods of teaching are applied, namely the method of teaching bounce ball to the wall, the throwing machine teaching method and the teaching method in pairs to see which teaching method is better in improving the drive punch skills in playing tennis. The method of teaching the ball throwing machine in its implementation emphasizes teaching itself against the throwing machine. Teaching with a ball throwing machine is compared to a tennis player against a ball throwing machine whose direction, rhythm and speed of a ball being thrown at first is not constant or changing, because it is influenced by environmental factors making it difficult for respondents in anticipating the arrival of the ball. But even so, over time the ball that was thrown by the tool, the direction, rhythm, and speed of the ball can be anticipated by the respondents because it is done repeatedly and become an automatic movement. Thus, based on the discussion of the results of the study, it can be concluded that the overall method of teaching bounce ball to the wall is better than teaching the throwing machine method to improve punch drive skills in playing tennis. So, the results of this study can be recommended that teaching better reflection of the ball to the wall and are suitable to be applied in improving the punch drive skills on the game of tennis (McCrone, 2014).

2. **The Difference Between the Method of Teaching Ball Reflection to the Wall (A1) and the Teaching Method in Pairs (A3) Against Drive Punch Skills in Tennis Court Games.**

The method of teaching the reflection of the ball to the wall is one form of teaching in its implementation, emphasizing teaching itself with the wall (Jia, 2019). The method of teaching in pairs, both between players and players, as well as players and coaches, means that in making a stroke, the movement is determined according to the rhythm of the movements of both. The method of teaching in pairs in practice also emphasizes independent teaching. Teaching in pairs, it means to make a drive movement skill based on the ability of each partner. Thus, based on the discussion of the results of the study, it can be concluded that the overall method of teaching pairs is better than the method of teaching bounce ball to the wall to improve the drive punch skills in playing tennis on the court. So, the results of this study can be recommended that teaching in pairs is better and suitable to be applied in improving punch drive skills in playing tennis. This study can be the alternative to teaching tennis in a group method .

3. **The Difference Between Throwing Machine Teaching Method (A2) and Teaching Method in Pairs (A3) Against Drive Punch Skills in Tennis Court Games.**

The method of teaching the ejection machine which in its implementation, emphasizes teaching together with the ejection machine as a substitute for the trainer. Teaching together with opponents to play in the form of a ball throwing machine (Lewis & Barberi, 2019), which means doing a ball hitting motion based on the rhythm of the throwing machine. The method of teaching in pairs, both between players and players, as well as players and coaches to make a stroke the movement is determined according to the rhythm of the movements of both. Thus, if this can be used as automation in making a drive, it will undoubtedly make it easier to anticipate and hit the ball back against its partner. Based on the discussion of the results of the study, it can be concluded that the overall paired teaching method is better than the ejecting machine teaching method to improve drive punch skills in playing tennis on the court. So, the results of this study can be recommended that teaching in pairs is better than throwing machine and suitable to be applied in improving punch drive skills in playing tennis.

4. Interaction Between Teaching Methods (A) With Hand-Eye Coordination (B) Against Drive Punch Skills in Field Tennis Games.

To improve punch drive skills is inseparable from teaching skills that are carried out routinely under the teaching programs provided. Apart from teaching skills also physical training which aims to improve physical fitness. The good physical condition will contribute when doing daily activities in a long time without experiencing significant fatigue. In the game of tennis, drive punch skills require high hand-eye coordination. By having high hand-eye coordination, a person can solve problems that might arise unexpectedly while teaching, so that he can anticipate and make punches correctly and adequately. From the description above, it can be concluded that there is a high interaction between teaching methods and hand-eye coordination of drive punch skills in playing tennis in the field. It might depend on the technique of adaptation to disordered hand-eye coordination (Jenkins, 2005).

5. The Difference Between the Method of Teaching Ball Reflection to the Wall (A1B1) with the Throwing Machine Teaching Method (A2B1) of the High Hand-Eye Coordination Group Against Drive Punch Skills in Tennis Court Games.

For students or players who have high hand-eye coordination, it means that they have the potential to be able to make overall movements. The method of teaching a bounce of a ball to the wall will provide an alternative to the overall drive skill. This teaching method is very appropriate when applied to students who have high hand-eye coordination. This can occur because the application of the method of teaching the reflection of the ball to the wall will guide students in controlling the driving drive that is done so that the accuracy and speed of the ball can be done well. High hand-eye coordination possessed by a student is a good supporting factor for mastering forehand drive and backhand drive skills. High hand-eye coordination as in Jenkins (2005) is a supporting factor in the accuracy and mastery of punch drive skills in playing tennis, both those who are trained with the method of teaching bounce ball to the wall and those who are trained with the method of teaching a ball throwing machine.

6. Difference between Method of Teaching Ball Reflection to Wall (A1B1) and Paired Teaching Method (A3B1) High Hand-Eye Coordination Group Against Drive Punches in Field Tennis Games

For students who are trained using the method of teaching the reflection of the ball to the wall and the method of teaching in pairs with high hand-eye coordination does not have a significant effect on the drive skills. However, high hand-eye coordination (Jenkins, 2005), can provide the maximum contribution for both teaching methods to punch drive skills, both to groups of students who are given the method of teaching ball bounce to the wall or the method of teaching in pairs. This is possible because the method of teaching the reflection of the ball to the wall uses closed motion skills (close skill). Whereas the teaching method in pairs uses open skills, these two movement skills are always used interchangeably in sports activities.

7. Difference Between Throwing Machine Teaching Method (A2B1) and Teaching Method Paired (A3B1) High Hand-Eye Coordination Group Against Drive Punches in Field Tennis Games.

Based on the results of the analysis of research data, it can be interpreted that there are significant differences in drive punch skills in playing tennis between the throwing machine teaching method group and the teaching method pairing group in the high hand-eye coordination group. Coordination is one of the supporting factors in implementing a punch drive to carry out movements or work very precisely and efficiently. The ejecting machine teaching method is a form of teaching that requires high hand-eye coordination, because with high hand-eye coordination, of course, a player can coordinate the view in observing the arrival of the ball and take proper punches with a swing from the hand. The level of eye coordination as in Jenkins (2005) of students/players' hands influences the appearance in playing movements playing tennis, especially in terms of drive punch skills, ranging from preparation, the arrival of the ball and the accuracy of hitting the ball. So that the implementation of this movement looks beautiful and perfect.

8. The Difference Between the Method of Teaching Ball Reflection to the Wall (A1B2) with the Throwing Machine Teaching Method (A2B2) of the Low Hand-Eye Coordination Group Against the Punch Drive Skills in Field Tennis Games

The method of teaching bounce the ball to the wall is teaching, which is done by the number of players only one person, where the player makes a drive punch starting from the front and up to the back of the field (Bucher & Hernández, 2016). Likewise, with the ejection machine where both players do the teaching starting from the front to the back of the field. Both teaching methods can be used to improve punch drive skills for students as the culprit. However, with the different treatment or teaching methods are given, it will affect the ability to hit the drive.

9. Difference Between Method of Teaching Ball Reflection to Wall (A1B2) and Paired Teaching Method (A3B2) Low Hand-Eye Coordination Group Against Drive Punch Skills in Field Tennis Games

Based on the results of the analysis of research data, it is interpreted that there are significant differences in punch drive skills in the playing field of tennis between the teaching method group reflecting the ball to the wall and the teaching method group in pairs with low hand-eye coordination. The method of teaching bounce the ball to the wall is to teach without the help of friends or coaches and carried out individually by the player by doing a drive punch where teaching is started from a standing position in the front. The player tries to control the ball so that the ball which is bounced off remains straight and returns to the back-area right in front of the body. Teaching really requires control from the individual who does the teaching so hand-eye coordination is an essential factor. Thus, it can be recommended that students who have low hand-eye coordination are expected to use the method of teaching a bounce of the ball to the wall to improve the results of teaching drive punch skills in playing tennis.

10. Difference Between Throwing Machine Teaching Method (A2B2) and Pair Teaching Method (A3B2) Low Hand-Eye Coordination Group Against Drive Punch Skills in Field Tennis Games

Based on the results of the analysis of research data, it can be interpreted that there is no significant difference in punch drive skills in playing tennis in the real field between the throwing machine teaching methods group and the pair teaching method group on groups of students who have low hand-eye coordination. This is because the two forms of teaching have similarities that cannot be separated from each other. Thus it can be recommended that the two teaching methods namely the ejecting machine teaching method and the paired teaching method do not have a significant difference for students who have low hand-eye coordination towards improving the teaching results of punch drive skills in playing tennis so that both of them are good to apply at the same time, tennis athletes are expected to improve their driving skills (Kolman, Kramer, Elferink-Gemser, Huijgen, & Visscher, 2019).

CONCLUSIONS AND SUGGESTIONS

Based on the findings in this study, it is expected to have implications for the development of teaching methods to improve punch drive skills in playing tennis. The implications of the results of the study can be stated as follows. The findings from the research conducted as stated in the conclusions above show that there is an influence of the interaction between the teaching method and hand-eye coordination on the drive skills in playing tennis. With the discovery of the effect of this interaction, it can be interpreted that the three teaching methods have different influences on the drive skills in playing tennis.

When linked to hand-eye coordination ability, in the group of students who have high hand-eye coordination, it turns out that the method of teaching pairs is better when compared to the method of teaching bounce ball to the wall and the method of teaching the throwing machine, whereas in groups of students who have low hand-eye coordination teaching method bounce the ball to the wall is better when compared to the ejection machine teaching method and the method of teaching pairs. These findings indicate that the ability of hand-eye coordination needs to be taken into consideration in the development of drive punch skills in

playing tennis. Keep in mind that tennis, especially the drive stroke skill, requires a combination of eyes, hands and feet to react quickly and accurately. So that is the need to involve in this research that is the combination of the eyes used to see an object and done by hand, or by coordinating words between the eye and hand in making a move. Thus eye-hand coordination is vital to support in practicing tennis drive punch skills.

In other words, to improve the drive punch skill in playing tennis, it is necessary to involve hand-eye coordination factors in which the physical condition elements mentioned above. Other findings in this study, that the data obtained shows that overall teaching methods in pairs have an influence which is better compared to the method of teaching bounce ball to the wall and the method of teaching the ejecting machine to the punch drive skills in playing tennis. As such, it can be recommended that the paired teaching method be more suitable to be applied in improving drive punch skills in playing tennis. For students who have high hand-eye coordination, the data obtained shows that the teaching method in pairs gives a better influence compared to the method of teaching bounce ball to the wall and the method of teaching the throwing machine to the punch drive skills in playing tennis.

Thus, it can be recommended that the paired teaching method is more suitable for students who have high hand-eye coordination in improving drive punch skills in playing tennis in the field. For students who have low hand-eye coordination, the data obtained shows that the method of teaching bounce ball to the wall gives a better influence than the throwing machine teaching method and the paired teaching method to punch drive skills in playing tennis. Thus, it can be recommended that the method of teaching bounce ball to the wall is more suitable to be applied for students who have low hand-eye coordination in improving punch drive skills in playing tennis.

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